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British Association for the Advancement of Science. Meeting at Bristol, September 3rd to 10th, 1930

Although purely meteorological papers and discussions played little part in the Bristol meeting of the British Association, border-line topics were well represented, and provided ample interest for the meteorologists present.

On the morning of September 4th the proceedings in Section A (Mathematical and Physical Sciences) opened with a discussion on "The Meteorological Relations of Atmospherics." In opening the discussion Mr. R. A. Watson Watt said that the immediately active work on the origin of atmospherics is associated with the names of Appleton, Austin, Bureau, Dean and Harper, Lugeon, Paolini, Schindelhauer and himself. He described briefly the present working hypothesis of each of these authors, and summarised critically their experimental work, illustrating the examination by the discussion of typical cases. He then stated the most definite conclusions as to the meteorological relations of atmospherics which a normally critical physicist would regard as justified by the existing experimental evidence, and suggested critical tests to resolve some of the differences of view.

Mr. F. Entwistle read a communication from M. R. Bureau, in which he illustrated the principle of his method of recording atmospherics. These included the recording of different cate-

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gories, the separation of strong from feeble atmospherics, the registration on different wave-lengths and the influence of wave-lengths on diurnal variation. Results obtained at Mt. Valerien and St. Cyr were compared, and examples were given of long-range and of local atmospherics. Finally, he discussed the amplitude of the night maximum and its variations with latitude and longitude.

Prof. E. V. Appleton, F.R.S., pointed out that it seemed desirable to ascertain whether a case could be made out for a predominantly terrestrial origin of atmospherics, and he therefore considered the various extra-terrestrial sources which have been suggested. He concluded, however, that the thunderstorm mechanism seems a more likely source. He then called attention to the experimental fact found by Watson Watt, Herd and himself that for atmospherics of local origin, negative electrostatic field changes are about 1.5 times as frequent as positive, while for those of distant origin positive radiation field changes are about 1.5 times as frequent as negative.

Mr. C. S. Durst, speaking on behalf of Mr. M. A. Giblett, described how observations of the sources of atmospherics made at the Radio Research Station, Slough, at 13h. G.M.T. daily were transmitted immediately to the Meteorological Office, Royal Airship Works, Cardington, Beds., where they were plotted on the current synoptic weather charts and studied in connexion with them. He outlined the results of this experiment in synoptic meteorology.

On Saturday, September 6th, some 350 members of the British Association visited the recently opened Bristol Municipal Airport at Whitchurch. An excellent "Garden Party and Air Display" was organised by the Bristol and Wessex Aeroplane Club, and the flying programme included aerobatic displays, bombing competitions, demonstrations of different types of aircraft including the Autogiro, a parachute descent and "joy riding." The programme also included a demonstration by the Meteorological Office of weather forecasting. Although threatening clouds covered the sky, no rain occurred during the greater part of the afternoon, and the demonstration was given in the open air. With the collaboration of the Signals Branch of the Air Ministry, weather maps for 10h. and 13h. were constructed from broadcast synoptic data picked up on a temporary aerial. A "Local Daily Weather Report" containing a forecast for the ensuing 24 hours was prepared and displayed, together with other charts and diagrams. The demonstration attracted very considerable attention, not only from members of the Association, but also from local and visiting pilots, many of whom had flown from distant places in adverse weather conditions. In a short speech to the visitors, the Lord Mayor of Bristol (after consultation with the meteorologist in charge of the demonstra-

tion) repudiated a suggestion that his arrival was the cause of the cessation of rain which had threatened to mar the proceedings.

On the morning of Monday, September 8th, Dr. F. E. Smith, C.B., C.B.E., Sec.R.S., delivered the Presidential Address to Section A, choosing as his subject "The Theories of Terrestrial Magnetism." Dr. Smith began by referring to early magnetic conferences and resolutions urging international co-operation, and questioned whether our plans are sufficiently well laid. He pleaded for the adoption by many of the first-class magnetic observatories of a programme of simultaneous observations with similar instruments of great sensitivity, emphasising that while each observatory should have its own problems and its own methods of attacking them, and thus preserve its individuality, it should in addition have part of its equipment of an international type and part of its programme truly international in character.

The President then discussed in technical detail the cause of the earth's magnetism and the cause of its variations. He said that there were three theories, the first and simplest being that the earth was a large permanent magnet due to the magnetization of the material of which it consisted. The second supposed that the electric charge on the earth's surface produced the magnetic field by its rotation. The third possibility was that the earth was an electro-magnet, the magnetizing currents being either outside the earth or within it, on a plan which had been roughly illustrated by Wilde's famous magnetarium. But Gauss had given criteria showing that the main origin of the earth's magnetic field was within the earth and Schuster that the cause of the daily variations was external to the earth's surface. Any predominant magnetic effect due to external causes need not be looked for. None of these theories are completely satisfactory, and consequently, as the late Dr. Chree remarked, the deductions from them are just as hypothetical as the theories themselves. Hence, in conclusion, he emphasized that data of a precise kind are much needed to modify existing theories and to produce new ones.

On Monday afternoon, Dr. C. E. P. Brooks read a paper in Section E (Geography) on "Changes of Climate in the Old World during Historic Times," of which the following is a summary:—

The paper studies the distribution of climate over Europe, Asia and northeastern Africa during five critical periods. In the first, between 2500 and 2000 B.C., the whole area seems to have been abnormally dry, but especially western and central Europe, where the drying up of the lakes shows that the rainfall was probably only about half the present amount. In England easterly winds prevailed. The second period, between

800 and 400 B.C., was abnormally rainy in northwestern and central Europe, and probably rainier than at present in southeast Europe, southwest Asia and northeast Africa. The raininess in Europe, however, was not so abnormal as the dryness of the first period. The climate of the third period, from 0 to 200 A.D., has been the subject of great controversy. A critical discussion suggests that conditions probably differed little from the present, but such differences as did exist were in the direction of heavier rainfall in northwest Europe and perhaps also in the Mediterranean. In this connexion an appendix by Miss L. D. Sawyer analyses a remarkable calendar compiled by Claudius Ptolemaeus in Egypt. The fourth period, 300 to 800 A.D., was on the whole dry; the droughts seem to have reached their greatest intensity in the seventh century in Asia between 30°N. and 45°N. An analysis by Mr. C. E. Britton of a number of droughts described by chroniclers in England is given in an Appendix, which shows that they have little foundation. The last period, the twelfth to fourteenth centuries, was remarkably wet and stormy in the countries bordering on the North Sea. The coasts of Friesland, Holland and eastern England were struck by a series of catastrophic "storm floods," which wrecked the coastal defences of Holland and formed the Zuyder Zee. Probably the region between the eastern Mediterranean and central Asia was also rainier than at present.

A great deal more evidence is required before a detailed account can be given of the course of climatic changes in the historical period. It is suggested, however, that since about 800 B.C., the variations have been of the nature of local departures, first one region and then another experiencing an excess or defect of rainfall, on a similar scale to the changes which now occur from one decade to another. The first period discussed, 2500 to 2000 B.C., was on a quite different plane; the weather of Europe, Asia and Africa must have presented marked differences from the present, probably sufficient to warrant appeal to world-wide or cosmical forces.

Afterwards Professor A. E. Douglass gave a very interesting account of "Past Changes in Climate in Relation to Settlements in the New World," in which he described his researches into the tree-rings of Arizona. He showed that in that dry climate there is very close agreement between the amount of rainfall in a year and the width of the annual ring of tree-growth formed in that year. The variations of rainfall are generally similar over an extensive area, and he showed photographs of sections of trees 120 miles apart in which the parallelism leapt to the eye. Thus, by means of the growth rings of living pine trees an idea of the variations of rainfall could be formed over a period of five or six hundred years. By studying the beams used in building the Indian villages of about 1400 A.D., often

preserved only in the form of charcoal, it was possible to go very much further, and to extend the record of the pines back well towards the beginning of the Christian era. An interesting result of this study was that it was possible to identify the year in which the trees forming many of the logs had been cut, and so to date the villages with remarkable accuracy. The complete series of records is likely to prove of the greatest possible value for studies of periodicities.

On the same afternoon Mr. L. A. Cammiade gave to the anthropologists an account of "Pluvial Periods in Palæolithic India," in which he demonstrated the occurrence of three periods of heavy rainfall and three dry periods near Madras.

On Tuesday, September 9th, two interesting discussions took place. The physicists discussed "Flow in Gases," the speakers being Mr. E. Ower, Mr. F. C. Johansen, Mr. E. G. Bilham and Mr. C. S. Durst. The first two speakers are members of the staff of the National Physical Laboratory, and their contributions dealt purely with the methods of measuring gas flow under laboratory conditions. Mr. Ower, whose work on the measurement of low air speeds, is well known, described the precautions necessary for obtaining accurate results with the pitot-static tube and also gave an account of a new manometer designed to measure with precision the small differences of pressure set up by air speeds of the order of 2 feet per second. Mr. Johansen emphasized the advantages of the hot-wire anemometer, especially when it was desired to make measurements at specific points in regions where the velocity varies rapidly from point to point.

Mr. Bilham in a paper on "Some Recent Improvements in Meteorological Anemometry" gave a brief account of the improvements made since 1925 in both the design and distribution of anemometers in the British Isles. Investigations at the National Physical Laboratory by L. F. G. Simmons and F. C. Johansen* between 1925 and 1928 led to the adoption of an improved form of Dines' anemograph with a shielded head and connecting pipes of 1-in. steel tubing. Charts exhibited at the meeting showed that the number of Dines' anemographs whose data are regularly published in the *Monthly Weather Report* had increased from 27 in 1925 to 36 in 1930 and that 18 of the stations operating in 1930 were equipped with instruments of the improved pattern. An account was also given of the 3-cup Robinson anemometer designed by J. Patterson of Toronto. This instrument has been adopted as standard by the Meteorological Service of Canada and the United States Weather Bureau. Test data show that Patterson's 3-cup system might with advantage replace the 4-cup systems on small Meteorological Office anemometers of the electric and indicating patterns.

* See *Meteorological Magazine*, 64, 1929, p. 7.

In the absence of Mr. M. A. Giblett, Mr. C. S. Durst gave an account of the investigation on wind-structure carried out by the Meteorological Office, Royal Airship Works, Cardington. By utilising Dines' anemographs fitted with quick running clock-drums, information has been obtained regarding the travel of disturbances superposed on the main wind stream, over an area of linear dimensions approximately equal to the length of a rigid airship such as H.M.A.S. R.101. The information so obtained is not only of meteorological interest but of considerable practical value in connexion with the design of airships and mooring towers.

The geographers, anthropologists and geologists combined for a prolonged discussion on " The relations between past Pluvial and Glacial Periods," under the chairmanship of Prof. H. J. Fleure. The evidence for pluvial periods in the Faiyum, Palestine, Kenya and Rhodesia was set out by Miss E. W. Gardner, Miss D. A. E. Garrod, Mr. L. S. B. Leakey and Dr. Armstrong; the sequence is most clear in Kenya and Uganda where, as Mr. Leakey explained, the lake beaches show a late Pliocene and early Pleistocene wet period or " pluvial," a long relatively dry " inter-pluvial " accompanied by earth movements, and a second pluvial with two peaks, followed by an arid period and two " post-pluvial " wet stages. Dr. G. B. Barbour described the pluvial and inter-pluvial periods in China, where, he said, pluvial periods coincided with inter-glacial periods in Europe and inter-pluvial periods with glacial periods. On the glacial side the position was much less clear; there is as yet no agreement as to the number of glacial periods in different countries, and so far from the glacial advances in different areas being contemporaneous, Prof. J. W. Gregory explained that there is much evidence that in Europe and North America different glacial centres reached their maxima successively. It appeared that there is no possibility as yet of correlation between the various glacial advances of the Alps and Scandinavia. Only Prof. W. J. Sollas held out for the definite acceptance of the scheme developed by Penck and Brückner in the Alps, which postulates four glacial advances, the first and second and the third and fourth being separated by short inter-glacials and the second and third by a much longer inter-glacial.

Dr. C. E. P. Brooks described to the meeting the theory of the ice age developed by Dr. G. C. Simpson,* who was unfortunately not able to be present. This theory would have as a definite result that the first two glacial periods and the first interglacial of Penck and Brückner's scheme would be represented by a pluvial period, the long second interglacial would be an interpluvial period, and the third glacial, third inter-

* Past Climates. Alexander Pedler Lecture 1929. Manchester, Mem. Lit. Phil. Soc., 74, 1929-30, pp. 1-34.

glacial and fourth glacial would be represented by a second pluvial period. Thus Dr. Simpson's theory agrees closely with the facts set out by Mr. Leakey.

Dr. Brooks then proceeded to explain his own views of the correlation, which agreed in the main with those of Dr. Simpson. He thought that while the details of the series of glacial advances and retreats might be obscure, there could be little doubt of the existence of one important interglacial corresponding with the Mindel-Riss of Penck and Brückner's scheme. The other interglacials, if they existed at all, were on a much smaller scale. He explained that the general amount of rainfall over the globe must equal the amount of evaporation, which in turn rested mainly on the wind velocity, governed by the strength of the atmospheric circulation and ultimately, by the temperature difference between equator and poles. Whatever the initial cause of glaciation, the great cooling power of ice resulted in a stronger circulation and heavier rainfall during glacial periods. This heavy rainfall would not be uniformly distributed however, but would fall mainly on the equatorial flanks of the glaciated regions and near the equator, all places where pluvial periods were well developed. On the other hand, we should expect that regions which owed their rainfall to monsoons, developed in spite of and against the general direction of the atmospheric circulation, would experience a smaller rainfall during glacial periods, and this accounted for the succession described by Dr. Barbour in China and Mr. Cammiade in India. In the afternoon the Chairman summed up the results of a very fruitful discussion, but some of the speakers continued it informally over the tea-table until a much later hour—an opportunity of the sort for which meetings of the British Association are often responsible.

Apart from the papers and discussions, the Bristol meeting was memorable for the numerous and admirably arranged excursions, which included Bath, Stonehenge and Avebury stone circle, the Cheddar Gorge and other famous places of interest, while such small amount of leisure as these attractions left to the members could be spent in the reception room and writing room of the palatial building of the University, opened to the Association as its headquarters by the courtesy of the University authorities.

OFFICIAL NOTICE

Discussions at the Meteorological Office

The series of meetings for the discussion of recent contributions to meteorological literature, especially in foreign and colonial journals, were resumed at South Kensington on Monday, October 13th. The subject for this meeting was a paper by Tor

Bergeron entitled *On three-dimensional constructive analysis of weather*. Part I. (Oslo. Geofys. Publ. Vol 5, No. 6), (in German). The discussion was opened by Sir Gilbert Walker, C.S.I., F.R.S.

The meetings are held on alternate Mondays at 5 p.m. The subjects for the next two meetings are:

October 27th, 1930. *On persistence and coagulation of fog and clouds*. By A. Wigand and E. Frankenberger. (Phys. Zs., Leipzig, 31, 1930. pp. 204-15), (in German). *Opener*—Mr. F. J. Scrase, M.A., B.Sc.

November 10th, 1930. *Illumination from sun and sky in the neighbourhood of Stockholm in* 1928. By T. E. Aurén. (Stockholm, Stat. Hydro-Meteor. Anst., Medd. 5, No. 4, 1930.) *Opener*—Mr. P. I. Mulholland, B.Sc.

The dates for subsequent meetings are as follows:—

November 24th, December 8th, 1930, January 12th and 26th, February 9th and 23rd and March 9th, 1931.

The Director of the Meteorological Office wishes it to be known that visitors are welcomed at these meetings.

Official Publications

The following publications have recently been issued:—

The Meteorological Glossary. In continuation of the Weather Map. 2nd edition, entirely rewritten (M.O. 225ii). Pp. 233. *Illus.* Price 4s. 6d.

The first edition of the Meteorological Glossary was issued in 1916, and was reprinted with additions in 1917 and again in 1918. Since 1918 there have been many advances in meteorology, for example, in connexion with the study of weather maps, and the new edition has been almost completely re-written. Each article is the work of an expert in the branch of meteorology with which it deals, but care has been taken to keep the style clear and readable throughout, while the various articles are co-ordinated by a simple system of cross-indexing. The 233 pages contain 618 articles ranging from a few lines to four pages in that on *Rain*. Among other articles to which special reference may be made are: *Depression*, giving a full account of the modern theories about the structure of barometric depressions, *Clouds*, illustrated by eight half-tone reproductions, and *Radiation*, in which the application of important principles of physics to meteorology is clearly explained. For use as a book of reference, the various tables have been brought as nearly as possible up to date, and the latest available determinations of physical constants have been employed throughout. The new edition is given a larger page than the earlier issues, a change which has facilitated the use of illustrations, and in addition to numerous figures in the text, there are a series of

photographic reproductions of clouds and other meteorological phemomena, and six lithographs in colour of typical weather charts. To assist in reading meteorological papers in foreign languages, the new edition contains also a long list of technical terms, which are not generally found in dictionaries, in Danish, Dutch, French, German, Italian, Norwegian, Portuguese, Spanish and Swedish. The volume is attractively bound in blue cloth boards lettered in gold.

Annual Report *of the Director of the Meteorological Office, presented by the Meteorological Committee to the Air Council, for the year ended March* 31, 1930.

This report describes the activities of the Meteorological Office during the seventy-fifth year of its existence and the tenth year in which its cost has been borne on Air Ministry votes. The year was one of great activity in international co-ordination and, as well as meetings of several commissions, the report includes accounts of three important conferences—the International Conference on the Safety of Life at Sea which met in London during April and May, 1929, the Conference of Empire Meteorologists in London in August and the International Conference of Directors of Meteorological Services at Copenhagen in September. These conferences led amongst other things to the recognition of marine meteorology in international treaties, to a radical improvement in the interchange of meteorological data throughout the world, and to a much closer connexion between the meteorological services of the British Empire.

In the actual work of the Office during the year outstanding features were the adoption by the Forecast and Aviation Services on March 1, 1930, of the new international code for the transmission of meteorological messages, which was approved at the Conference of Directors at Copenhagen, and the arrangements made by the Airship Services Division in connexion with the trials of H.M. Airships R.101 and R.100.

Correspondence

To the Editor, *The Meteorological Magazine.*

Cyclones and Anticyclones

In your September number Captain Douglas begins the concluding paragraph of a note on "The Recent Heat and Thunderstorms" with the remark that the problems of anticyclones and cyclones are very closely analogous and will probably be solved together.

Recent examination of the subject leads me to express the view that anticyclones and cyclones are not two problems but

two aspects of a single problem, namely, the production of velocity in the atmosphere.

I have worked for years on the hypothesis that in the upper air the wind-velocity practically balances the gradient of pressure by the aid of the deviating force of the earth's spin and local centrifugal force (both at right angles to the motion); and now I go a step further and explain that if the velocity is too small for the balance there will an uncompensated component of force across the flow down the gradient tending to reduce it; but if, on the other hand, the velocity is too big for the balance the uncompensated component will be up the gradient and so available for throwing air along an isentropic surface from left to right of the path and increasing the gradient.

In either case the effect of the uncompensated component will be continued until the proper gradient for balance has been created.

So the general motion of the atmosphere is a continuous process of spontaneous adjustment of the pressure to the motion; and as the process operates at every level of the moving air, and commences automatically with any deviation whatever from the strophic balance, the adjustment of pressure to motion will be as automatic as that of the attitude of a bicyclist on the road or a skater on the ice. To me this dual aspect of the question is new; but I am glad to say that I find a number of my friends already regard it as commonplace, which indeed it might quite well be for it is obvious enough when once stated.

Margules indeed appeared to be at a loss to account for an increase of pressure by motion of air up the gradient; but now it is clear that the cross acceleration is no exceptional occurrence, it happens automatically if the velocity is too big for balance.

Hence we may understand that a cyclone will be dug, on the left-hand side, and, by the same action, an anticyclone piled up on the right-hand side of any current of air in the atmosphere except indeed at the equator.

This view throws the burden of the meteorological problem on discovering the origin of velocity. I have not seen the problem so stated in the text-books; but one can gather some information about it from Helmholtz's papers. I had hitherto assumed that the gods first created pressure-difference and nature converted it into velocity; but now I think the gods create velocity and nature converts it into pressure-difference, and I should very much like to know what are the gods in this case and how they do it; the only ones I can think of are the downward convexion of cooled air, the upward convexion of saturated air and the conservation of moment of momentum. I wonder if your readers have any more. NAPIER SHAW.

10, Moreton Gardens, S.W.5. September 18th, 1930.

The Recent Heat and Thunderstorms

I have read with interest the article under the above heading which appeared in the *Meteorological Magazine* for September, 1930, p. 177. On the subject of researches into the causes of these high temperatures, permit me to indicate that the explanation can be found in the variations of the solar phenomena.

Indeed, observation shows that in our countries in the west of Europe—

1. All increase of sun-spots or faculæ is followed by a rise in temperature.
2. All decrease of sun-spots or faculæ is followed by a fall of temperature and by the formation of barometric depressions on the North Atlantic.

These two cases are shown in the variations of the temperature during the last month: the increase of sun-spots from the beginning to the 24th of August has been followed by very high temperatures until the decrease of these spots from September 5th to 10th. On the other hand the decrease then, the absence of sun-spots on September 18th and 19th, has been followed by a violent storm over the west of Europe.

TABLE I.—THE HIGHEST TEMPERATURES OF THE SUMMER OF 1930 (END OF AUGUST TO THE BEGINNING OF SEPTEMBER) HAVE COINCIDED WITH A RECRUDESCENCE OF SUN-SPOTS.

In a great number of cases and with excessively simple methods such as that which consists in comparing, each day, the number of sun-spots with the variations of temperature, the relation can be seen which, in the west of Europe unites these two phenomena. It is therefore easy to state that the very high temperatures beween August 24th and September 6th have coincided exactly with a persistent recrudescence of sun-spots at this epoch.

	Sunspots No. of groups (each day).		Sunspots No. of groups (each day).		Sunspots No. of groups (each day).	
Aug.	15th	1	Aug. 24th	4	Sept. 8th	4
,,	16th	1	,, 25th	4	,, 9th	(3)
,,	17th	1	,, 26th	4	,, 10th	2
,,	18th	3	,, 27th	5	,, 11th	3
,,	19th	3	,, 28th	4	,, 12th	2
,,	20th	3	,, 29th	4	,, 13th	3
,,	21st	2	,, 30th	4	,, 14th	4
,,	22nd	2	,, 31st	4	,, 15th	2
,,	23rd	2	Sept. 1st	5	,, 16th	2
			,, 2nd	6	,, 17th	1
			,, 3rd	6	,, 18th	0
			,, 4th	7	,, 19th	0
			,, 5th	5	,, 20th	1
			,, 6th	7		
			,, 7th	7		

Recrudescence of persistence solar activity

Violent tempest over the west of Europe. The decreases of sun-spots or faculæ are always followed by the formation of depressions over the North Atlantic.

Summarising, the cause of the principal atmospheric changes in our countries is found generally in the variations of the solar phenomena, but it is indispensable to note, each day, the

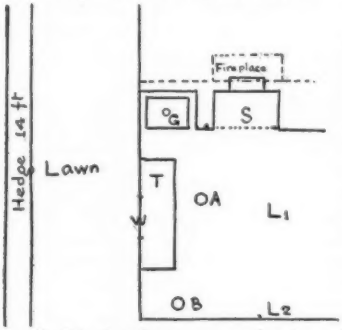
continual modifications which are produced on the surface of the sun.

HENRI MEMERY.

Observatoire de Talence, Gironde, France. September 24th, 1930.

Ball Lightning

The following is an account of what was probably a case of ball lightning seen at Remuera, a suburb of Auckland, at about 17h. 5m. on June 9th, 1930. Lightning was seen during the afternoon, but no thunder or lightning was observed in the vicinity at the time mentioned. The weather was dull with "clouds like thunderclouds," but no precipitation was falling. The report of the occurrence was handed to Prof. P. W. Burbidge of the Auckland University College, by a senior student, Mr. M. J. O'Sullivan.



In the sketch, G is a central iron flue leading from above a gas stove straight through a galvanised-iron roof; S is an iron cooking stove. The gas stove was alight at the time, but the other stove was not. T is a table against a window. L_1 is an electric lamp which was burning, and L_2 is a wall lighting point. Mr. O'Sullivan was sitting at B talking to his mother, who was facing him at A.

Suddenly there was a loud and sharp explosion, accompanied by a very bright yellow flash. The flash appeared to Mr. O'Sullivan to be horizontal and in a line from near the stoves to a point below L_1. To Mrs. O'Sullivan it appeared head high and to her right rear. The electric light and the gas stove continued to burn and nothing was damaged or disturbed. No smell was observed. The explosion was not due to escaping gas.

EDWARD KIDSON.

Meteor. Branch, Dept. of Scientific and Industrial Research, Wellington, New Zealand. June 18th, 1930.

A Northumberland Thunderstorm

On the afternoon of Tuesday, August 12th, there was an outbreak of violent thunderstorms over north-east England and south-east Scotland. At Rothbury we caught the edge of one

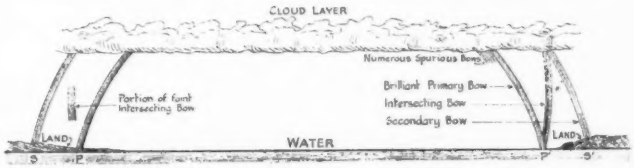
of the storms, there being one or two heavy crashes of thunder immediately after vivid flashes of lightning with some rain and hail. But the remarkable feature here was the sky, the like of which I do not remember having seen before during the actual progress of a storm. The moors all around were wrapped in a deep blackness through which the dark craggy edge of the Simonside Hills stood out with menacing effect; but the valley of the Coquet lay for nearly half an hour beneath a rift of pure blue sky, bordered on either side by massive sun-lit clouds throwing on to the valley a lovely silver light of remarkable intensity.

L. C. W. Bonacina.

Rothbury, Northumberland. August 20th, 1930.

Intersecting Rainbows.

On the evening of August 12th, whilst camping on the foreshore, on the Scottish side of the Solway Firth near Brow Houses, towards 7 p.m. G.M.T. during a local thunderstorm which was moving southwestwards across the Firth, I observed an unusually brilliant primary rainbow together with a secondary with numerous spurious bows on the under side of the southernmost portion of the primary. The bows were not complete as there was an interrupting cloud layer at approximately 2,000ft. level. The important part, however, of the observation was



the appearance of an intersecting bow between the southern extremity of the primary and the secondary bow, the intersection at the primary being sharp at the extremity whilst the intersection and ending of the secondary bow was less sharp, inclining towards a fade out, the intersection here taking place near the cloud level. The colours of the intersecting bow were brilliant and of the same order as those of the primary. The whole phenomena on the southern portion of the rainbow resembled the letter N, but with the connecting stroke in the reverse direction, as shown in the sketch.

Such an intersecting bow arises from the presence of two sources of parallel rays. In the present instance one set was that coming directly from the sun giving the primary and the secondary bows and the other set from the image of the sun in

the bay to the westward of the point of observation. The image being as much below the horizon as the sun was above it, the centre of the intersecting bow was thus as much above the horizon as the centre of the primary was below it. The display lasted for nearly half an hour and was watched by a number of people. The water in the Solway was at low tide and almost perfectly calm. To the north side there were at times only faint traces of the intersecting bow.

J. CRICHTON.

6, Drumsheugh Gardens, Edinburgh. September 4th, 1930.

Red Sunrises and Sunsets.

I read with much interest the article by Spencer Russell on this subject. From a lad I was interested in forecasting weather by sunset colour and became fairly proficient and now in my later life it is my hobby—and my experience is red sunrise will enable one to forecast wind or rain during the 24 hours. Sunset reds are varied and the only colour which can be depended upon is the rosy afterglow colour; at times the faint colours from the setting sun's rays are yellow and then generally followed by a pinky red and rain is sure to follow and at times severe winds. I have rarely been out in my local forecast for the following day and as a rule these colours are in harmony with the use of barometer, wind changes, temperature, humidity which I note daily to assist in my forecasting.

I have tested these sunset colours away from home without the aid of instruments and have rarely if ever failed in correct forecast. Now in my 85th year I hold to this experience.

HENRY A. ROGERS.

31, Fernbank Road, Redland, Bristol. August 27th, 1930.

Halo Phenomena in False Cirrus.

In the *Meteorological Magazine* for September (p. 187) S. E. Ashmore directs attention to this phenomenon. I remember during the war an observer noticed part of a halo in the extension of an anvil cloud and remarked that false cirrus is true cirrus. I am glad to say that the same view was taken by the International Commission for the Study of Clouds and the absurd name of false cirrus has been suppressed. In the new International Atlas of Clouds, which, in its abridged form, has just been published, the cloud in question is called cirrus nothus, which I think may well be translated hybrid cirrus; the name may not be free from criticism but it does express the mode of origin of the cloud whereas the term false cirrus does not express anything at all.

C. J. P. CAVE.

Stoner Hill, Petersfield. September 24th, 1930.

Peculiar Cloud Phenomena

At 15h. 43m. yesterday (Wednesday) a very unusual cloud effect occurred here. Through an evil-looking mass of nimbus and cumulo-nimbus in the east a pencil-like "shaft" of cloud penetrated downwards as in Fig. 1. The shaft appeared very black and dense—more so than the cloud mass. Within two minutes the "pencil-point" had broken off and the entire "shaft" rapidly dissolved upwards! A couple of minutes later another strange sight presented itself in a neighbouring system of large yellowish cumulus as in Fig. 2,—the pendulous "rat-tail" being jet-black. It suddenly unrolled itself (like an elephant's trunk) from the cloud and had vanished within two minutes.

FIG. 1

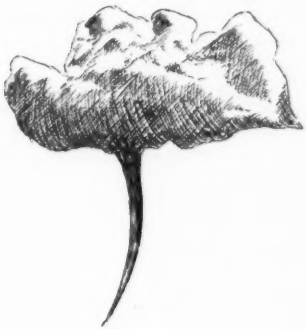


FIG. 2

The whole cloud system slowly advanced from south and partly encircled the house from south through southeast and east to northeast and north. No rain fell here but a few spots occurred to northwest of Ross some 5 miles distant (How Eaple). There was no thunder and wind was dead calm followed by light airs from SW. to SSW. Western sky less cloudy with "rocky" cumulus near horizon and some alto-cumulus. Barograph remained steady.

The first phenomenon approached to within 8° of the horizon and the second about 5° from the horizon.

The "funnel" actually came down to ground level at Weston-under-Renyard (2 miles eastsoutheast of Ross) and was described as a column of revolving smoke. As it touched earth it caused a "splashing shower and left a large wet patch."

F. J. PARSONS.

The Observatory, Ross-on-Wye. September 11th, 1930.

The Drought in North America.

In view of the article bearing the above title in the September

issue of the *Meteorological Magazine*, the following extract from a letter I received from a clergyman working in British Columbia may be of interest. It is dated August 4th from Salmon Arm, B.C.

"We are enjoying nice summer weather 95° in the shade, no rain for 3 months, forest fires abound, the smoke is terrific. However, next month will see it cooler, but rain is needed badly and prayers are being asked for by all our farmers . . . my shack as I sit here is 98°."

CICELY M. BOTLEY.

Guildables, 17, Holmesdale Gardens, Hastings. September 18th. 1930.

NOTES AND QUERIES

Official Course of Training for Observers

Twenty-five people attended this course; nine came from Health Resorts, the remainder from crop-weather stations or the Ministry of Agriculture. It was found that the accommodation at Kew was insufficient, but as this was not known until it was too late to inform all those who had applied to take the course, it was arranged that all concerned should attend at Kew on the first morning, when Dr. Whipple and Mr. Scrase explained some of the work of the Observatory. The course was then continued in the Library of the Meteorological Office, South Kensington. It followed the lines of previous courses, but advantage was taken of facilities for showing slides when discussing British climatology. Mr. E. G. Bilham, Superintendent of the British Climatology Division, explained to the crop-weather observers at the end of the second afternoon the new form for compilation of monthly and weekly summaries from a single sheet, while the rest of the party saw the arrangements for testing instruments in the Instruments Division.

E. V. NEWNHAM.

The Santo Domingo Hurricane

A report appeared in *The Times* of September 4th that a hurricane of considerably intensity had passed over Dominica on September 1st, resulting in two deaths and causing considerable damage to property. The hurricane was said to have passed over Porto Rico and to have devastated Santo Domingo city, but the real extent of the disaster at Santo Domingo was not made known until more detailed reports were received in the next few days.

It appears that the hurricane moving from southeast struck Santo Domingo at 2 p.m. on the 3rd, its full force lasted for four hours, the wind at times reaching 130 to 160 m.p.h., and owing to the damage to the wireless station and the land station of the submarine cable company, communication with

the outside world was interrupted for nearly 24 hours. When communication was restored the magnitude of the disaster increased in each successive report. It is now believed that over 4,000 persons lost their lives and 5,000 were more or less seriously injured, one-quarter of the entire population of the city being involved, and over three-quarters of the total number of houses in the city are estimated to have been destroyed. The water supply plant being much damaged, the prospect of outbreaks of disease had to be provided against and as the medical supplies in the neighbouring islands were quickly exhausted, arrangements were made for conveying fresh supplies by aeroplane. Extensive relief work was soon organized in the United States, Porto Rico, Cuba and Haiti, and several shiploads of supplies reached the city within a few days. The hurricane seems to have attained destructive intensity only in the neighbourhood of Santo Domingo and was stated to have lost some of its intensity in the mountains of Haiti. A report from San Pedro de Macorio, some 40 miles to the eastward, stated that only a 60 miles an hour gale was experienced there. No reports of damage seem to have been received during the further progress of the storm across the Bahamas towards Florida. Later reports showed that the damage in Dominica though slight in comparison with that inflicted on Santo Domingo was more extensive than was at first thought. Six people lost their lives, the damage to public works is estimated at £10,000 and about 50 per cent of the lime crop, 75 per cent of the coconut crop and the whole of the late cocoa crop are said to have been destroyed.

Extensive reports on West Indian hurricanes have been published by the United States Department of the Agriculture Weather Bureau. These show that the hurricane season is at its height during August and the first part of September, but previously September hurricanes have usually avoided the island of Haiti, the tracks pursued from the Lesser Antilles generally lying to east or south of the island. The most destructive storm as regards material damage, in the West Indies of recent years was that of September 13th, 1928, in Porto Rico. On this occasion the loss of life did not exceed 300, owing to the approach of the storm having been announced in time for precautions to be taken. In the storm of August 8th, 1899, over 3,000 lives were lost in Porto Rico, a figure which has unfortunately been exceeded in the recent disaster in Santo Domingo.

S. T. A. MIRRLEES.

A Storm on Victoria Nyanza

The second of the series of *Memoirs* issued by the British East Africa Meteorological Service consists of an account by

Mr. A. Walter, the Director, of a storm on Victoria Nyanza on the night of May 18th-19th, 1930. These storms appear to occur only in the late evening or very early morning, and are probably part of the process of readjustment after the disturbance of the air and thunderstorm conditions caused by the intense solar radiation during the day. They are of the nature of tornadoes, with winds of force 8 or 10 surrounding a calm centre; the example described from observations made on the Lake Steamer *Clement Hill*, had a diameter not exceeding 30 miles and moved slowly from south-east to north-west across the equator; the direction of rotation was clockwise.

Review

Geochronology, by G. De Geer (reprinted from *Antiquity*, Vol. 2, 1928, pp. 308-17).

The author describes the annual clay laminæ deposited by the retreating ice-sheets of the last glaciation, and the methods by which they have been dated and compared one with another. He then discusses the possible ways in which other records of the past, such as delta deposits of great rivers, and successive shore lines of glacial lakes and seas, can be accurately dated. If the ages of archæological horizons in different parts of the world could be exactly determined, much light would be thrown on the migrations of early man. We may add that the full publication of long series of such measurements extending to the present day would be of inestimable value to the study of climatic variations.

Books Received

Report on Rainfall Registration in Mysore for 1928. By C. Seshachar, M.A. Bangalore, 1929.

Nautisk-Meteorologisk Aarbog, 1929. The Danish Meteorological Institute, Copenhagen, 1930.

Obituary

Dr. Wilh. R. Eckardt.—We regret to learn of the death of Dr. Eckardt, Director of the Meteorological Observatory in Essen. Born on October 11th, 1879, at Hildburghausen, Dr. Eckardt studied biology and geography; these subjects led him to bioclimatology and especially to the evidence of past climates to be derived from the study of fossils. His little book "Paläoklimatologie" (Sammlung Goschen, 1910) was remarkable for its good sense and moderation at a time when some rather wild ideas on geological climates still prevailed, and it can still be read with profit. After some experience in a publishing house, he became an assistant in the Meteorological Service of Aachen and in April, 1913, he joined the newly

formed Meteorological Observatory in Essen, where he did much to reorganise the publication of meteorological data for western Germany. He became Director of the Observatory in 1919 and held the post until his death. The best known of his later works is the "Grundzüge einer Physioklimatologie der Festländer," published at Berlin in 1922, but he also inspired and guided much of the work of his younger colleagues.

With deep regret we learn of the disaster to H.M. Airship R 101 with the loss of 48 lives, including that of Mr. M. A. Giblett, M.Sc., Superintendent of the Airship Meteorology Division. An appreciation of Mr. Giblett's life and work will appear in the *Meteorological Magazine* for November.

News in Brief

Mr. G. A. Clarke, of the Meteorological Office, Aberdeen, has been awarded a medal by the Royal Photographic Society for his work on cloud photography.

The Weather of September, 1930

Unsettled weather prevailed generally over the country during the greater part of the month with temperature and rainfall above normal and pressure and sunshine below normal, except in the extreme west, where rainfall was deficient in the north and sunshine slightly in excess in the south. The opening days of the month were warm and sunny, as much as 12·6 hrs. bright sunshine being recorded at Hastings, Southport and Armagh on the 2nd, but this fine anticyclonic spell was broken on the 4th when a depression spread across the country from the west. There ensued a period of unsettled weather with frequent local thunderstorms. Slight rain fell on most days with heavy falls locally on the 10th and 12th but there were many bright sunny periods especially on the 7th, 8th and 10th when between 10 and 11 hrs. sunshine were experienced at some places. Temperature was high and on the 5th rose to above 80°F. in parts of southeast England. A severe and very local thunderstorm occurred in eastern London on the 10th, as much as 2·40in. of rain being measured at Telegraph Hill, southeast London, that day. On the 13th a depression off southwest Ireland moved rapidly eastnortheast and gave general moderate rain which was followed by a welcome sunny day on the 15th when York had 11·5 hrs. bright sunshine, Aspatria and Jersey 11·3 hrs. and Clacton, Rothesay and Rhayader 11·1 hrs. From the 17th onwards conditions became very unsettled with deep depressions passing rapidly eastwards across the country. General heavy rain occurred and strong winds and gales. The

roughest weather was experienced about the 19th and 20th and the heaviest rain from the 17th-19th inclusive. At Holne (Devon) 2·26in. fell on the 17th, 1·17in. on the 18th and 1·82in. on the 19th. At Talyllyn (Merioneth) and at Tynywaum (Glamorgan) 2·20in. fell on the 19th. Thunderstorms occurred in northern England on the 19th and much fog developed in the west on the 22nd. A change occurred about the 25th when an anticyclone over the Atlantic began to spread east and increase in intensity in the rear of a depression off northern Scotland. A cold northerly current from the Arctic spread over the British Isles and on the 27th day temperatures did not exceed 50°F. in parts. Local gales occurred on a few days. From the 27th to the end of the month anticyclonic weather prevailed generally in Scotland, north England and north Ireland, but in south-eastern England weather continued cloudy with heavy rain at times, 2·45in. fell at Snape, Suffolk, on the 27th. Local thunderstorms occurred in northwest England on the 24th and in southern England on the 27th.

A notable feature of the month was the high night temperature; at Kew the mean minimum temperature was 3·8°F. above normal and at Ross-on-Wye 3°F. The minimum of 62°F. at Kew on the 23rd is a record for the last ten days of September. It was the wettest September on record at Gorleston and Phœnix Park, Dublin. The distribution of bright sunshine was as follows:—

	Total (hrs.)	Diff. from normal (hrs.)		Total (hrs.)	Diff. from normal (hrs.)
Stornoway	91	— 24	Liverpool	110	—18
Aberdeen	? 73	— 51	Ross-on-Wye	118	—18
Dublin	129	— 10	Falmouth	167	+ 4
Birr Castle	110	— 16	Gorleston	124	—38
Valentia	142	+ 9	Kew	117	—28

Pressure was above normal over Svalbard, Iceland, Scandinavia, Spain, Italy and Bermuda, the greatest excess being 11·3mb. at Jan Mayen and 2·3mb. at Corunna. Pressure was below normal over most of the North Atlantic, the British Isles, France and central Europe, the greatest deficit being 3·3mb. at Tynemouth, The Helder and Horta. Temperature was generally below normal over northern and central Europe, but above normal in the south, while rainfall was generally in excess in northwest Europe but deficient in central Europe. In the northern half of Sweden rainfall was about half the normal but in north Svealand it was 20 per cent. above the normal and in south Sweden more than twice the normal locally.

A cloudburst near Catania (Sicily) destroyed many crops about the 3rd and two people were swept away by the flood. Two deaths were reported from Bilbao (Spain) on the 6th due to the excessive heat. Severe thunderstorms swept the south coast of

France and the Midi on the 11th and much damage was done. The same day a violent wind lasting about 10 minutes swept over Saint Remy de Provence leaving a track 200 yds. wide in which everything was damaged. Four waterspouts, each 90 ft. high, were seen off Posilipo (Bay of Naples) on the 15th but no damage was done on sea or land. A violent thunderstorm caused much damage to the village of Tourette-du-Château (Esterel, Var, France) on the 15th. Severe storms were experienced along the northern French coast on the 19th and 20th during which 40 Breton fishermen were drowned.

Over 100,000 people are reported to have been affected by floods caused by a sudden rise in the Brahmaputra River in the Nowgong district of Assam about the 4th. The districts of Bokoni and Laokhoa were particularly affected. At Bombay 22in. of rain fell on the 9th and 8in. on the 10th, so that serious floods resulted. Several subsidences and small landslides took place. Heavy monsoon rains continued there again on the 13th and 14th, after which the floods in the Tapti Valley were particularly severe. The fall of 22in. on the 9th constitutes a record for Colombo, the next largest fall being one of 16in. in 1886. The monsoon was active in Burma and northeast India in the week ending the 24th and active in South Peninsula the following week, during which it had retreated from north and central India.

Good rains occurred in western Australia; in the eastern States it was warm and dry at first with showery weather later.

Temperature in the United States was above normal (except along parts of the Pacific coast) during the first three weeks being as much as 10°F. above normal at Baltimore in the week ending the 23rd, while rainfall was generally below normal. Moderate temperatures with rainfall slightly under normal prevailed generally in Argentina. A hurricane of unusual intensity swept over the West Indies on the 1st-3rd.*

The special message from Brazil states that the rainfall was generally scarce with averages of 0·47in., 0·59in.,, and 0·91in. below normal in the northern, central and southern regions respectively. Five typical but not very intense anticyclones passed across the country. An unusual gale with many continued gusts over 30m/s occurred at Rio de Janeiro on the 1st. The crops were generally affected by the lack of rain. At Rio de Janeiro pressure was 1·4mb. above normal and temperature 0·5°F. below normal.

Rainfall, September, 1930.—General Distribution

England and Wales	179	per cent of the average 1881-1915.
Scotland	144	
Ireland	154	
British Isles	165	

*See page 216.

Rainfall: September, 1930: England and Wales

Co.	Station	In.	Per-cent of Av.	Co.	Station	In.	Per-cent of Av.
Lond.	Camden Square.....	3·58	197	*Leics.*	Belvoir Castle.....	3·78	202
Sur.	Reigate, Alvington....	3·99	192	*Rut.*	Ridlington.....	4·15	...
Kent.	Tenterden, Ashenden...	3·27	153	*Line.*	Boston, Skirbeck.....	3·67	209
,, .	Folkestone, Boro. San..	3·68	...	,, .	Cranwell Aerodrome...	4·37	245
,, .	Margate, Cliftonville...	4·35	221	,, .	Skegness, Marine Gdns	3·45	191
,, .	Sevenoaks, Speldhurst	3·81	...	,, .	Louth, Westgate.....	3·69	183
Sus.	Patching Farm.....	3·16	132	,, .	Brigg, Wrawby St....	3·58	...
,, .	Brighton, Old Steyne..	2·36	113	*Notts.*	Worksop, Hodsock.....	3·73	245
,, .	Heathfield, Barklye....	4·26	174	*Derby.*	Derby, L. M. & S. Rly.	3.98	241
Hants.	Ventnor, Roy. Nat. Hos.	3·07	124	,, .	Buxton, Devon Hos....	5·11	158
,, .	Fordingbridge, Oaklnds	4·35	202	*Ches.*	Runcorn, Weston Pt...	2·96	111
,, .	Ovington Rectory.....	3·53	154	,, .	Nantwich, Dorfold Hall	3·18	...
,, .	Sherborne St. John....	3·79	185	*Lancs.*	Manchester, Whit. Pk.	2·90	122
Berks.	Wellington College.....	3·18	173	,, .	Stonyhurst College....	3·53	92
,, .	Newbury, Greenham...	2·79	138	,, .	Southport, Hesketh Pk	2·39	87
Herts.	Welwyn Garden City...	3·45	...	,, .	Lancaster, Strathspey	2.55	...
Bucks.	High Wycombe.....	3·82	203	*Yorks.*	Wath-upon-Dearne....	4·09	259
Oxf. .	Oxford, Mag. College..	3·35	199	,, .	Bradford, Lister Pk....	4·87	235
Nor.	Pitsford, Sedgebrook...	4·03	224	,, .	Oughtershaw Hall.....	5·25	...
,, .	Oundle.....	3·53	...	,, .	Wetherby, Ribston H.	3·80	211
Beds.	Woburn, Crawley Mill	2·59	145	,, .	Hull, Pearson Park.....	2·85	166
Cam.	Cambridge, Bot. Gdns.	...	...	,, .	Holme-on-Spalding.....	3·16	...
Essex.	Chelmsford, County Lab	3·59	209	,, .	West Witton, Ivy Ho.	4·14	...
,, .	Lexden Hill House....	5·09	...	,, .	Felixkirk, Mt. St. John	4·38	241
Suff.	Hawkedon Rectory.....	4·47	232	,, .	Pickering, Hungate....	3·89	...
,, .	Haughley House.....	4·59	...	,, .	Scarborough.....	3·59	201
Norf.	Norwich, Eaton..... ...	5·65	264	,, .	Middlesbrough.....	2·54	153
,, .	Wells, Holkham Hall	4·18	220	,, .	Baldersdale, Hury Res.	3·30	...
,, .	Little Dunham.....	5·83	253	*Durh.*	Ushaw College.....	2·91	145
Wilts.	Devizes, Highclere.....	3·76	184	*Nor.*	Newcastle, Town Moor	2·86	140
,, .	Bishops Cannings.....	3·66	164	,, .	Bellingham, Highgreen	3·90	...
Dor.	Evershot, Melbury Ho.	3·94	148	,, .	Lilburn Tower Gdns....	3·46	...
,, .	Creech Grange.....	3·61	...	*Cumb.*	Geltsdale.....	2·57	...
,, .	Shaftesbury, Abbey Ho.	3·15	129	,, .	Carlisle, Scaleby Hall	2·09	77
Devon.	Plymouth, The Hoe...	5·05	198	,, .	Borrowdale, Seathwaite	8·75	88
,, .	Polapit Tamar,.....	5·30	189	,, .	Borrowdale, Rosthwaite	7·16	...
,, .	Ashburton, Druid Ho.	7·14	229	,, .	Keswick, High Hill....	3·59	...
,, .	Cullompton.....	4·99	221	*Glam.*	Cardiff, Ely P. Stn....	4·56	147
,, .	Sidmouth, Sidmount...	4·41	192	,, .	Treherbert. Tynywaun	9·56	...
,, .	Filleigh, Castle Hill....	5·96	...	*Carm.*	Carmarthen Friary.....	5·92	171
,, .	Barnstaple. N. Dev. Ath.	4 85	180	,, .	Llanwrda.....	7·20	177
Corn.	Redruth, Trewirgie.....	6·69	214	*Pemb.*	Haverfordwest, School	6·51	183
,, .	Penzance, Morrab Gdn.	5·74	196	*Card.*	Aberystwyth.....	4·61	...
,, .	St. Austell, Trevarna...	6·73	211	,, .	Cardigan, County Sch.	4·59	...
Soms.	Chewton Mendip.....	4·58	149	*Brec.*	Crickhowell, Talymaes	6·30	...
,, .	Long Ashton.....	4·24	....	*Rad.*	Birm W. W. Tyrmynydd	7·96	206
,, .	Street, Millfield	3·24	...	*Mont.*	Lake Vyrnwy.....	6·94	196
Glos.	Cirencester, Gwynfa....	3·58	163	*Denb.*	Llangynhafal.....	2·69	...
Here.	Ross, Birchlea.....	3·49	182	*Mer.*	Dolgelly, Bryntirion...	4·95	116
,, .	Ledbury, Underdown..	3·27	171	*Carn.*	Llandudno.....	2·81	123
Salop.	Church Stretton.....	3·88	191	,, .	Snowdon, L. Llydaw 9	14.15	...
,, .	Shifnal, Hatton Grange	3·09	160	*Ang.*	Holyhead, Salt Island	3·14	117
Worc.	Ombersley, Holt Lock	3·51	198	,, .	Lligwy.....	2·77	...
,, .	Blockley.....	3·40	..	*Isle of Man*			
War.	Farnborough.....	3·99	187		Douglas, Boro' Cem....	6·30	193
,, .	Birminghm, Edgbaston	4·01	224	*Guernsey*			
Leics.	Thornton Reservoir....	4·02	222	. .	St. Peter P't. Grange Rd.	3·57	137

Rainfall: September, 1930: Scotland and Ireland

Co.	Station	In.	Per-cent. of Av.	Co.	Station	In.	Per-cent. of Av.
Wigt.	Pt. William, Monreith	4·44	...	*Suth.*	Loch More, Achfary...	4·76	83
,, .	New Luce School.....	4·04	...	*Caith.*	Wick.....	3·87	155
Kirk.	Carsphairn, Shiel.....	6·70	...	*Ork.*	Pomona, Deerness.....	4·43	153
Dumf.	Dumfries, Crichton, R.I	2·79	109	*Shet.*	Lerwick	3·22	107
,, .	Eskdalemuir Obs.....	4·23	114	*Cork.*	Caheragh Rectory.....	5·04	...
Roxb.	Branxholm	3·52	157	,, .	Dunmanway Rectory...	5·08	124
Selk.	Ettrick Manse.....	3·91	...	,, .	Ballinacurra.....	4·97	197
Peeb.	West Linton.....	3·40	...	,, .	Glanmire, Lota Lo.....	5·39	192
Berk.	Marchmont House.....	4·49	186	*Kerry.*	Valentia Obsy.....	4·79	116
Hadd.	North Berwick Res.....	3·33	159	,, .	Gearahameen.....	8·80	...
Midl.	Edinburgh, Roy. Obs.	4·16	221	,, .	Killarney Asylum.....	5·01	140
Ayr.	Kilmarnock, Agric. C.	2·75	90	,, .	Darrynane Abbey.....	4·54	127
,, .	Girvan, Pinmore..	5·52	148	*Wat.*	Waterford, Brook Lo...	3·87	140
Renf.	Glasgow, Queen's Pk..	5·48	198	*Tip.*	Nenagh, Cas. Lough...	3·51	125
,, .	Greenock, Prospect H.	4·58	97	,, .	Roscrea, Timoney Park	3·61	...
Bute.	Rothesay, Ardencraig.	4·65	115	,, .	Cashel, Ballinamona...	3·46	141
,, .	Dougarie Lodge.....	4·03	...	*Lim.*	Foynes, Coolnanes.....	3·75	130
Arg.	Ardgour House	6·75	...	,, .	Castleconnel Rec.....	3·93	...
,, .	Manse of Glenorchy...	5·04	...	*Clare.*	Inagh, Mount Callan...	4·67	...
,, .	Oban.....	3·40	...	,, .	Broadford, Hurdlest'n.	3·48	...
,, .	Poltalloch	3·83	84	*Wexf.*	Gorey, Courtown Ho...	5·38	218
,, .	Inveraray Castle...	5·56	87	*Kilk.*	Kilkenny Castle.....	3·63	157
,, .	Islay, Eallabus.....	3·66	87	*Wic.*	Rathnew, Clonmannon	5·50	...
,, .	Mull, Benmore.....	12·40	...	*Carl.*	Hacketstown Rectory..	6·05	216
,, .	Tiree	2·72	...	*Leix.*	Blandsfort House.....	3·92	144
Kinr.	Loch Leven Sluice.....	4·54	176	,, .	Mountmellick.....	4·05	...
Perth.	Loch Dhu.....	5·60	98	*Off'ly.*	Birr Castle.....	3.86	168
,, .	Balquhidder, Stronvar	5·33	...	*Kild'r.*	Monasterevin	4·02	...
,, .	Crieff, Strathearn Hyd.	4·60	161	*Dubl.*	Dublin, FitzWm. Sq...	6·87	357
,, .	Blair Castle Gardens...	3·68	155	,, .	Balbriggan, Ardgillan.	5·76	283
,, .	Glen Bruar, Bruar Ldg.	5·61	...	*Me'th.*	Beaupare, St. Cloud...	4·78	...
Angus.	Kettins School.	3·76	189	,, .	Kells, Headfort.....	4·64	174
,, .	Dundee, E. Necropolis	4·69	225	*W.M.*	Moate, Coolatore.....	3·14	...
,, .	Pearsie House.....	5·47	...	,, .	Mullingar, Belvedere..	4·67	175
,, .	Montrose, Sunnyside...	4·76	239	*Long.*	Castle Forbes Gdns.....	3·52	122
Aber.	Braemar, Bank...	5·53	220	*Gal.*	Ballynahinch Castle...	7·60	159
,, .	Logie Coldstone Sch....	6·07	261	,, .	Galway, Grammar Sch.	3·31	...
,, .	Aberdeen, King's Coll.	4·53	204	*Mayo.*	Mallaranny.....	4·64	...
,, .	Fyvie Castle.....	5·64	...	,, .	Westport House.....	3·96	112
Moray.	Gordon Castle.....	4·62	185	,, .	Delphi Lodge.....	9·05	...
,, .	Grantown-on-Spey.....	4·24	171	*Sligo.*	Markree Obsy.....	4·01	120
Nairn.	Nairn, Delnies	3·04	138	*Cav'n.*	Belturbet, Cloverhill...	3·20	129
Inv.	Kingussie, The Birches	3·58	...	*Ferm.*	Enniskillen, Portora...	2·46	...
,, .	Loch Quoich, Loan.....	8·31	...	*Arm.*	Armagh Obsy.....	3·00	122
,, .	Glenquoich.....	6·88	80	*Down.*	Fofanny Reservoir.....	6·73	...
,, .	Inverness, Culduthel R.	3·07	...	,, .	Seaforde.....	4·34	158
,, .	Arisaig, Faire-na-Squir	3·68	...	,, .	Donaghadee, C. Stn...	3·63	152
,, .	Fort William.....	5·17	...	,, .	Banbridge, Milltown...	3·36	...
,, .	Skye, Dunvegan.....	3·98	...	*Antr.*	Belfast, Cavehill Rd...	4·84	...
R & C.	Alness, Ardross Cas ...	3·33	114	,, .	Glenarm Castle.....	4·19	...
,, .	Ullapool	3·23	...	,, .	Ballymena, Harryville	3·07	99
,, .	Torridon, Bendamph...	5·37	77	*Lon.*	Londonderry, Creggan	2·89	88
,, .	Achnashellach.....	3·94	...	*Tyr.*	Donaghmore.....	2·89	...
,, .	Stornoway.....	2·79	71	,, .	Omagh, Edenfel.....	2·94	96
Suth.	Lairg.....	2·87	...	*Don.*	Malin Head.....	2·70	...
,, .	Tongue	2·63	83	,, .	Dunfanaghy.....	2·19	...
,, .	Melvich.....	...	...	,, .	Killybegs, Rockmount.	3·73	81

Climatological Table for the British Empire, April, 1930.

STATIONS	PRESSURE		TEMPERATURE							Relative Humidity.	Mean Cloud Am'nt	PRECIPITATION			BRIGHT SUNSHINE	
			Absolute		Mean Values				Mean							
	Mean of Day M.S.L.	Diff. from Normal	Max.	Min.	Max.	Min.	½ max. and min.	Diff. from Normal	Wet Bulb			Am'nt	Diff. from Normal	Days	Hours per day	Percentage of possible
	mb.	mb.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	%	0—10	in.	in.			
London, Kew Obsy. ..	1009·1	— 5·3	68	31	53·2	40·8	47·0	— 0·3	42·1	86	8·1	1·87	+ 0·42	14	3·5	25
Gibraltar.....	1012·6	— 3·9	71	47	65·5	51·8	58·7	— 2·3	51·9	85	6·0	4·52	+ 1·84	17	..	..
Malta	1011·0	— 3·0	79	47	65·4	54·1	59·7	— 1·2	55·1	77	5·3	0·82	— 0·04	6	9·0	69
St. Helena	1013·7	+ 0·8	..	58	..	60·3	..	..	61·5	94	9·2	4·57	+ 0·79	24	..	..
Sierra Leone	1012·7	+ 1·9	88	69	86·5	73·5	80·0	— 2·4	74·3	77	5·3	0·57	— 3·49	4	..	..
Lagos, Nigeria	1009·6	— 0·2	92	71	88·5	76·4	82·5	0·0	78·5	81	8·1	5·01	— 0·74	9	..	..
Kaduna, Nigeria	1013·9	+ 2·2	99	66	93·4	70·9	82·1	+ 0·6	72·2	66	1·0	1·25	— 2·04	5	..	..
Zomba, Nyasaland ..	1011·6	— 0·9	82	54	76·0	62·6	69·3	0·0	..	83	7·6	2·43	— 1·23	11	..	..
Salisbury, Rhodesia ..	1011·6	— 0·8	81	43	76·4	56·0	66·2	+ 0·5	58·8	66	4·3	0·23	— 0·76	7	7·5	64
Cape Town	1017·1	+ 0·8	88	43	73·8	52·8	63·3	+ 0·1	55·4	89	5·3	0·93	— 0·94	5	..	..
Johannesburg.....	1016·0	— 0·8	77	35	70·4	50·2	60·3	+ 0·5	50·2	57	2·7	0·52	— 1·22	7	8·7	76
Mauritius	1011·5	— 2·5	87	62	83·3	69·4	76·4	+ 0·6	72·0	68	4·8	1·34	— 3·13	11	8·1	70
Bloemfontein	..	..	..	..	..	..	..	..	..	..	..	2·17	+ 0·04	..	..	..
Calcutta, Alipore Obsy.	1006·6	+ 0·3	107	70	97·7	77·1	87·4	+ 1·7	75·9	74	3·0	0·11	— 1·78	0*	..	..
Bombay	1008·1	— 0·7	95	73	90·0	76·5	83·3	+ 0·2	75·0	72	1·4	0·00	— 0·05	0*	..	..
Madras	1008·1	— 0·3	101	73	92·8	77·2	85·0	— 0·3	78·5	74	4·7	0·00	— 0·53	0*	..	..
Colombo, Ceylon	1009·0	— 0·1	91	73	88·8	75·6	82·2	— 0·4	78·4	74	6·7	13·52	+ 5·22	17	8·0	65
Hongkong	1011·7	— 1·0	85	63	77·4	70·6	74·0	+ 3·2	70·6	86	8·1	2·10	— 3·20	9	4·7	37
Sandakan	..	..	92	74	89·4	75·9	82·7	+ 0·4	78·0	79	..	2·13	— 1·94	6	..	..
Sydney, N.S.W.	1019·2	+ 0·7	85	50	69·7	56·4	63·1	— 1·6	57·8	71	5·3	4·87	— 0·70	13	6·6	58
Melbourne	1020·1	+ 0·7	82	40	68·4	48·4	58·4	— 1·1	52·4	64	6·1	1·75	— 0·50	11	6·4	58
Adelaide	1020·0	0·0	89	50	75·6	55·6	65·6	+ 1·7	55·9	50	5·1	0·97	— 0·78	11	6·8	61
Perth, W. Australia ..	1016·7	— 1·8	89	48	77·2	57·9	67·5	+ 0·9	58·8	58	4·6	2·29	+ 0·71	7	7·0	62
Coolgardie	1017·5	— 1·0	90	42	74·2	52·1	63·1	— 2·0	56·1	62	4·5	2·91	+ 1·96	8	..	..
Brisbane	1017·4	— 0·2	84	55	77·7	59·9	68·8	— 1·5	62·3	66	4·7	2·25	— 1·34	9	7·3	64
Hobart, Tasmania....	1018·0	+ 3·5	78	37	60·9	47·7	54·3	— 0·8	49·5	74	6·9	2·01	+ 0·12	16	4·1	38
Wellington, N.Z.	1021·0	+ 2·9	70	40	62·7	50·0	56·3	— 0·6	52·8	75	6·1	3·86	— 0·02	6	6·1	55
Suva, Fiji	1012·0	+ 1·4	89	69	85·5	72·7	79·1	+ 0·4	74·9	78	5·7	6·46	— 4·82	17	7·0	60
Apia, Samoa	1009·1	— 0·8	87	71	85·7	74·4	80·1	+ 1·2	77·6	77	4·8	10·32	+ 0·08	15	7·2	61
Kingston, Jamaica....	1013·6	— 0·5	90	67	85·8	70·2	78·0	— 0·4	69·7	84	3·9	1·18	— 0·06	6	7·7	62
Grenada, W.I.	1010·4	— 2·0	90	72	87·1	73·5	80·3	+ 1·4	74·1	78	3·7	2·00	— 0·28	15	..	..
Toronto	1016·8	+ 1·3	71	25	51·0	34·7	42·9	+ 1·5	35·6	63	5·7	1·23	— 1·17	8	6·0	45
Winnipeg	1017·4	+ 0·4	71	17	53·7	32.9	43·3	+ 5·5	..	..	5·2	0·53	— 0·96	6	7·6	55
St. John, N.B.	1013·9	+ 0·3	58	17	46·8	30·4	38·6	— 0·4	33·9	65	5·1	1·90	— 1·61	12	6·9	51
Victoria, B.C.	1015·2	— 2·1	65	38	56·9	44·1	50·5	+ 2·8	47·2	78	6·9	1·00	— 0·73	8	6·1	45

* For Indian stations a rain day is a day on which 0·1 in. or more rain has fallen.

* For Indian stations a rain day is a day on which 0·1 in. or more rain has fallen.

* For Indian stations a rain day is a day on which .25 in. or more rain has fallen.